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INTRODUCTION*

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The 1970s witnessed remarkable advances in the field of diagnostic medical imaging. Conventional radiography and nuclear medicine imaging were joined by ultrasonography and computed tomography to provide a powerful arsenal for the clinician when faced with a great variety of medical and surgical problems. Radionuclide imaging differs from the other modalities in that it provides functional rather than morphologic information about the area being investigated. It accomplishes this by using a variety of radiotracers that, after oral or intravenous administration, follow normal biologic pathways and localize in an organ or organ system for sound physiologic reasons. The long-recognized ability of iodine-131-sodium iodide to localize in the thyroid gland is predicated upon the iodide being

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trapped by the gland and following the prescribed metabolic route for thyroid hormone formation. Similarly, other radiotracers now available allow imaging of almost every organ system.

The radiotracers consist of a nonradioactive carrier as well as a radionuclide. The carrier allows physiologic localization to occur while the nuclide emits gamma rays that are detected externally by a scintillation detector, thereby allowing the organ to be imaged. The most commonly used detector is the Anger scintillation camera.

The great majority of radionuclide imaging is performed with compounds labeled with technetium-99m (^{99m}Tc). The six-hour half life and pure 140 KeV gamma emission of this nuclide provide excellent camera images with low radiation dose to the patient.

During the past several years, emergency and acute diagnostic applications of radionuclide imaging have increased. The ease, simplicity, rapidity of performance, and low radiation dose associated with the methodology make it a natural choice in this diagnostic area. The articles that follow illustrate the contribution that nuclear medicine has already made to four important areas where rapid diagnosis is needed for appropriate therapy.